AD-A073 826 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS F/G 9/2
RESULTS OF GEOTECHNICAL COMPUTER USAGE SURVEY.(U)
AUG 79 D P HAMMER, R D BENNETT

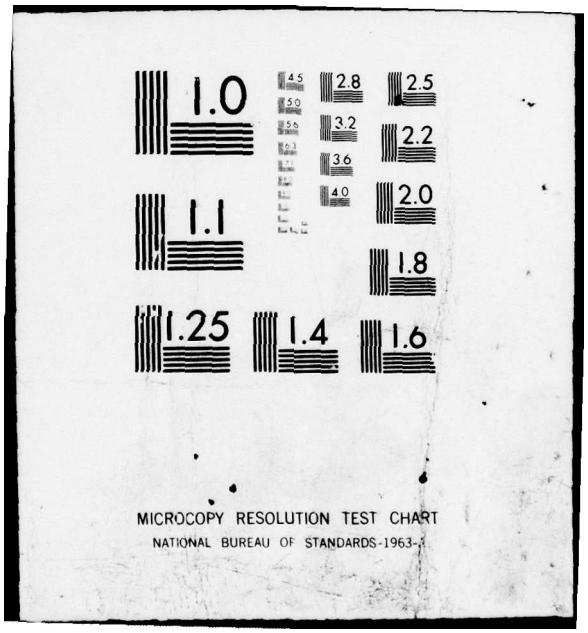
UNCLASSIFIED WES-MP-GL-79-19 NL

| OF |
AD
A073826





END
DATE
FILMED
10-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-

LEVEL II 12

MISCELLANEOUS PAPER GL-79-19

RESULTS OF GEOTECHNICAL COMPUTER USAGE SURVEY

by

David P. Hammer, Robert D. Bennett

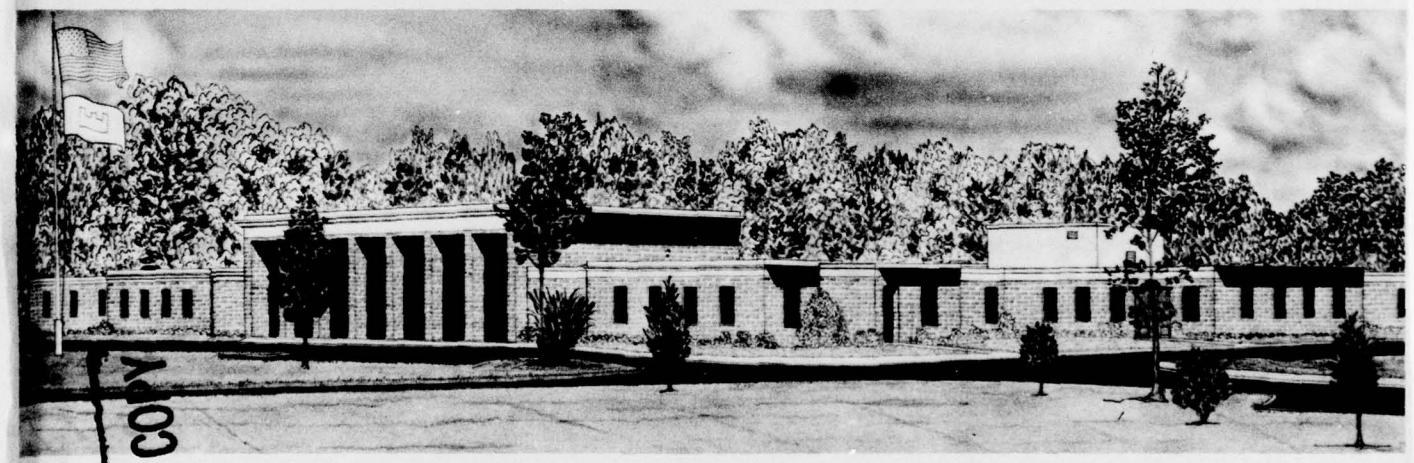
Geotechnical Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

AD A073826

DDC
RECEIVED
SEP 17 1979
C

August 1979
Final Report

Approved For Public Release; Distribution Unlimited



DDC FILE COPY

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

79 09 14 053

Destroy this report when no longer needed. Do not return it to the originator.

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products.

(14) WES-MP-GL-79-19

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Miscellaneous Paper GL-79-19
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): RESULTS OF GEOTECHNICAL COMPUTER USAGE SURVEY
5. TYPE OF REPORT & PERIOD COVERED: Final report
6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): David P. Hammer, Robert D. Bennett
8. CONTRACT OR GRANT NUMBER(s): (12) 47p

9. PERFORMING ORGANIZATION NAME AND ADDRESS:
U. S. Army Engineer Waterways Experiment Station
Geotechnical Laboratory
P. O. Box 631, Vicksburg, Miss. 39180

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:

11. CONTROLLING OFFICE NAME AND ADDRESS:
Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

12. REPORT DATE: August 1979
13. NUMBER OF PAGES: 42

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office):

15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Computer applications
Computers
Geotechnical engineering
State-of-the-art studies

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Recognizing a need for improving automatic data processing (ADP) capabilities in the geotechnical field, the Office, Chief of Engineers, requested the U. S. Army Engineer Waterways Experiment Station to conduct a study to determine if geotechnical elements in the Corps of Engineers (CE) thought an upgrading of their ADP capabilities was needed and, if so, exactly what type of effort would be most beneficial.

(Continued)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

038 100 JOB

20. ABSTRACT (Continued).

The first phase of this study consisted of a survey of various representative CE District and Division offices to investigate the state of the art in computer usage among CE geotechnical elements and compile what they considered to be their greatest needs. This report presents the results of that study.

Based on the results of this survey, an upgrading in the area of geotechnical computer applications is apparently needed and desired by the majority of CE District and Division offices. Efforts toward accomplishing this should be directed toward increasing capabilities in the areas of (a) data-base management, (b) interactive graphics and plotting, and (c) technology transfer.

Preface

The investigation reported herein was one phase of a project entitled "Computer Applications in Geotechnical Engineering," sponsored by the Office, Chief of Engineers (OCE), U. S. Army. The investigation was conducted by the U. S. Army Engineer Waterways Experiment Station (WES) during FY 78.

This report was prepared under the general supervision of Messrs. J. P. Sale, Chief, Geotechnical Laboratory (GL), and C. L. McAnear, Chief, Soil Mechanics Division, GL. Mr. Richard Malm was the OCE Technical Monitor. The project team consisted of Messrs. R. D. Bennett, Civil Engineer, GL, WES, D. P. Hammer, Research Civil Engineer, GL, WES, E. G. Metka, Automatic Data Processing (ADP) Coordinator, U. S. Army Engineer South Pacific Division, J. B. Palmerton, Research Civil Engineer, GL, WES, J. B. Phillips, Civil Engineer, U. S. Army Engineer District, Savannah, and D. Spaulding, Civil Engineer, U. S. Army Engineer District, St. Paul. Messrs. Hammer and Bennett prepared this report.

Others participating in the study were ADP and Geotechnical personnel in the various Corps of Engineers (CE) District and Division offices surveyed.

Directors of the WES during the investigation and preparation of this report were COL J. L. Cannon, CE, and COL N. P. Conover, CE. Technical Director was Mr. F. R. Brown.

Accession For	
NTIS GRA&I	☑
DDC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or special
A	

Contents

	Page
Preface	1
Introduction	3
Background	3
Conduct of survey	3
CE Division Offices	4
Geotechnical	4
ADP Center	6
CE District Geotechnical Offices	8
Purpose and scope of questionnaire	8
Topic I: General	9
Topic II: Present Computer Use	9
Topic III: Present Program Acquisition and Development	12
Topic IV: Current Working Relationship with the ADP Center	15
Topic V: Application Needs	16
CE District ADP Centers	18
Purpose and scope of questionnaire	18
Topic I: Present Capability	18
Topic II: Current Computer Use	20
Topic III: Acquisition and Development of Computer Applications	21
Topic IV: Working Relationship with Geotechnical Users	23
Topic V: Communications and Technology Transfer	24
Topic VI: New Applications in Geotechnical Engineering	25
Summary	26
CE Division geotechnical offices	26
CE Division ADP Centers	27
CE District geotechnical offices	28
CE District ADP Centers	29
Recommendations	31
Appendix A: Survey Questionnaire	A1

RESULTS OF GEOTECHNICAL COMPUTER USAGE SURVEY

Introduction

Background

1. Presently, each geotechnical element of Corps of Engineers (CE) District and Division offices independently develop the automatic data processing (ADP) capability necessary to aid in fulfilling its own mission. This method of operation is necessary because of lack of overall coordination within the field and has led to duplication of effort as well as a time lag between available ADP applications and what is currently being used. Such has not been the case with other disciplines, such as structures, hydrology, hydraulics, environmental, and oceanography. Existing Corps-wide coordinating efforts in these fields have led to improved ADP capabilities by increasing technology transfer and reducing duplication of efforts.

2. Recognizing a need for improving ADP capabilities in the goetechnical field, the Office, Chief of Engineers (OCE), U. S. Army, requested that the Geotechnical Laboratory at the U. S. Army Engineer Waterways Experiment Station (WES) conduct a study to determine if geotechnical elements in the CE needed as well as desired an upgrading of their ADP capabilities and, if so, exactly what type of effort would be most beneficial.

3. The first phase of this study consisted of surveying various representative CE District and Division offices to determine the state of the art in computer usage among CE geotechnical elements and what they considered to be their greatest needs. The purpose of this report is to present the results of that survey.

Conduct of survey

4. To accomplish the survey, a team of five CE geotechnical engineers with experience in ADP applications was formed. Questionnaires were developed for the ADP Center and geotechnical branch of each office to be surveyed. Since both District and Division offices were to be queried,

this resulted in four different type questionnaires (see Appendix A). In order to be certain that the information obtained was as complete as possible, the personnel of each office receiving a questionnaire were asked to answer the questions to the maximum extent possible and then hold the questionnaire until a team member visited their office to discuss the subject. To ensure frank and candid answers each office was assured that the results of the survey would be presented in anonymous form.

CE Division Offices

5. Questionnaires were sent to the Chief, Geotechnical Branch, and the ADP Coordinator of each Division office surveyed. Appropriate personnel were also individually interviewed. The following paragraphs present a summary of the answers received.

Geotechnical

6. Current District use. The majority of Division office geotechnical respondents felt that their District geotechnical branches are not making the best use of the computer as an engineering tool. Primary reasons given for this are:

   a. Lack of knowledge of available programs and operating systems (especially data-base systems).

   b. Scarcity of easily understandable and usable codes.

   c. Lack of adequate documentation for programs written by other CE offices.

   d. Lack of time (manpower) to become more familiar with computer applications.

7. Suggestions given for implementing more efficient use are:

   a. Standardization of systems that are compatible with each other and of programs that are OCE approved.

   b. Development of more data-base systems and programs to handle data transmission, storage, and retrieval.

   c. Mandatory training for increasing awareness and usage of available systems and programs (most felt that programming, program maintenance and adaptations, etc., should be left to ADP personnel).

8. Guidance to District offices. The majority felt that they could provide only limited guidance to District offices in order to increase their effective use of computer applications. However, several offices did offer the following suggestions as to how they could provide impetus concerning more effective computer use to their Districts:

a. Locate and make available needed programs.

b. Slant policy implementation toward more effective use.

c. Encourage or require a more unified and effective approach to data storage, retrieval, and analysis.

d. Aid in identifying tasks conducive to computer applications, which are presently being done manually.

e. Develop data-base systems at the Division level for use in storage, retrieval, analysis, and plotting of data from instrumentation, borings, soil testing, etc.

9. Assurance of computer results. Presently, assurance that computer calculated results are accurate and are done in accordance with desired procedures is achieved by manual checks of final design analyses. For cases where manual checks are not feasible (finite element, for instance), judgment and experience with similar problems must be applied. Use of example problems with known results was also cited as a program reliability check where manual checks are impractical. Almost all those queried emphasized that no analysis based solely on computer calculated results should be accepted without close scrutiny by human judgmental and analytical means.

10. Computer use by Division offices. Most respondents thought that as review organizations not actively involved in detailed analyses and design, extensive computer applications would not be cost-effective. Many did state, however, that it would be desirable to have access to their District's data, if for no other reason than to reduce time lost in transmission and communication. Some also believed that if they had access to District data, their capability for review would improve. Currently, use of the computer for data reduction, transmission, and plotting by Division material testing laboratories ranges from infrequent to nonexistent. A majority of respondents felt strongly that this is one area where implementation of computer applications would be most beneficial.

11. Increased computer utilization. Nearly all respondents thought that increased computer usage, if accomplished in a rational and proper manner, could help in maintaining or increasing the Corps current level of design in the face of today's environment of overall manpower reduction. Several stressed the point that they felt increasing usage beyond a certain point (undefined) could foster too much dependence on the computer, thus decreasing the use of engineering judgment and "feel" for reasonable solutions; therefore, steps taken in this area should be made with careful deliberation.

12. Centralization of geotechnical computer applications. The establishment of a central office within the CE for geotechnical program development, review, documentation, and dissemination was viewed by most offices as being a good idea. Respondents emphasized that particular attention should be directed toward adaptation and documentation of existing programs (rather than writing new ones) and development of data-base programs, all of which are compatible with existing systems. Other requests were for expert troubleshooting assistance and training.

ADP Center

13. Effectiveness of present computer use. Of the CE Division offices queried, half responded that the computer was not being used effectively by the engineering divisions in their Districts and the other half stated that it was being used effectively, but all thought that effective use could be increased. The following suggestions were offered as means to increase effective use:

a. Provide additional ADP manpower.

b. Provide new, modern in-house computer systems (minicomputer most often stressed) and keep system changes to a minimum.

c. Establish software centers for each engineering discipline (Hydrological Engineering Center (HEC) given as an example).

d. Implement more training.

e. Place more emphasis on communications between the ADP Center and the user.

f. Somehow change the attitudes of managers and users to a more positive one with respect to computer applications.

14. Policy regarding user priorities. No one seems to have a formal policy regarding user priorities. This appears to be primarily a problem of the past, being solved to a large degree by the advent of time-sharing. All offices seem to operate under an informal priority system, which seems to work; no one reported any problems in this area.

15. ADP capabilities provided to Division testing laboratories. Very little ADP support is being requested or supplied to Division testing laboratories in the geotechnical area. Some offices reported they were beginning to get requests for limited support. All respondents believed that considerable potential exists for ADP support in this area.

16. Channels for user feedback. There are presently no formal ADP advisory committees or similar bodies to provide ADP user feedback to CE Division offices. One office reported having a semiformal ADP advisory group that provides user feedback and another reported having a group within its finance and accounting section that performs this function, but all others either receive no feedback at all or utilize existing organization structure with ADP contact points in key areas. Although nearly all thought that feedback to the Division ADP elements from users could be beneficial, there was no strong feeling one way or the other about whether or not the establishment of a formal committee for this purpose would help.

17. Communication regarding user needs and technology transfer. Only two respondents stated that existing communications between the ADP Center and users concerning user needs and technology transfer in general were adequate. The following comments were offered by those who reported that communications in this area were inadequate:

a. The ADP Coordinator and his staff must become more involved in all aspects of engineering involvement, i.e., training, obtaining required equipment, etc.

b. A software center (previously mentioned in paragraph 14) should be established with communication improvement and technology transfer being a major part of its duties.

c. The ADP Center should be staffed at a level to bring potential computer applications to users without being asked.

d. The brief program abstract system should be reinstituted and circulated to potential users.

CE District Geotechnical Offices

Purpose and scope of questionnaire

18. The questionnaire that District geotechnical branch personnel were asked to complete consisted of five main topics, with several questions under each topic. Topic I was general in nature and contained questions concerning branch size and organization, current work load, and how large a role the computer played in their work. Topic II, "Present Computer Use," determined how much the computer was being used and what the primary uses were. Topic III, "Present Program Acquisition and Development," sought information about the sources of current computer applications, where personnel would go for new applications, satisfaction with current procurement procedures and technology transfer, etc. The purpose of Topic IV, "Current Working Relationship with the ADP Center," ascertained how the two disciplines interrelated and what problems, if any, existed between the two. After identifying current geotechnical computer uses and problems in Topics I-IV, Topic V, "Application Needs," determined what each District geotechnical branch considered its most pressing needs with respect to computer applications.

19. The following paragraphs contain a summary of responses to each of the above-mentioned topics. In all, completed questionnaires were received from the geotechnical branches in 32 CE District offices.

Topic I: General

20. The responses from the majority of CE District geotechnical branches indicated they currently are or are in the process of becoming computer oriented (i.e., making considerable use of computer applications). They indicated their soils personnel are generally more computer oriented than their geologists. There were several reasons given for this, but the primary one was that soils design work was more conducive to computer applications and that there were more soils applications available. Those branches having instrumentation sections

reported heavy computer use by them, in some cases more than the soils personnel.

21. No correlation seems to exist between size of the staff and use of the computer. Nine offices having relatively large geotechnical staffs reported extensive computer use, while three with large staffs made very little use of the computer. On the other hand, eight Districts with relatively small geotechnical staffs considered themselves very computer oriented, while five others with small staffs did not. Apparently, the extent to which computer applications are utilized in a particular office is dependent on factors such as emphasis by supervisors and managers, how active the ADP Center is, and personnel interest at the working level; in other words, factors other than just need or size and type of work load.

22. Responses to the question, "What percentage of your work is considered "busy" work as opposed to analytical or judgmental work?" varied widely as would be expected due to variations in type and extent of work. The percentage varied from 0 to 90 percent "busy" work and averaged about 35 percent. Almost all respondents felt that more extensive use of the computer could significantly reduce the number of man-hours spent on "busy" work. The computer applications mentioned as most needed were data storage, retrieval, reduction, and presentation and less time-consuming, better documented analytical programs.

Topic II: Present Computer Use

23. The percentage of time spent on computer applications by geotechnical personnel varied from 0 to 50 percent. Ten Districts reported low use (i.e., little time and money spent on computer applications), while 18 reported moderate use and four, extensive use. However, these categories (i.e., low, moderate, and high) were subjectively defined by the person answering the questionnaire. If reported estimates of ADP costs and time spent on computer applications are reliable, then a more objective ranking, as tabulated below, can be established. Of course, even the categorization is relative to geotechnical use only, and if categorization was done with respect to other disciplines, the rankings might be quite different. The significance of the data in the tabulation

seems to be that it indicates a rather low level of computer use by geotechnical branches Corps-wide.

Category	Range of Estimated ADP Costs $/month	Range of Man-hours Spent hours/month	No. of Districts in Category
Low	0-250	0-30	14
Moderate	150*-3000	40-500	12
High	3000-13,750	180*-4400	6

* Some overlap in ranges due to cost of use not always being proportional to number of man-hours spent on computer use.

24. When asked if they thought computer costs were a significant factor in overall design cost, only three of the 32 respondents reported they were and even these three thought costs were a restraint only in some cases, such as in the use of an extensive finite element analysis. As a general rule, then geotechnical engineers apparently do not avoid using the computer because of cost. In fact, most respondents felt the computer was a real cost saver.

25. Available computer systems. In-house computer systems varied considerably among the Districts as did their use of them. Not only were there several different makes and configurations of in-house computers, but their use for engineering applications varied from 0 to 100 percent. The noncompatibility of present in-house systems and the policy governing their use is very evident. Many different contract systems are being utilized with WES, BOEING, INFONET, CSC, and LBL heading the list. The questionnaire requested that contract systems being utilized be ranked according to their effectiveness, but again the results were so varied that no definite conclusions could be drawn. It seems that the most effective system for a particular office is the one that the users are most familiar with. Most offices did rank the contract services over their in-house service. However, this is not surprising since most in-house systems are outmoded and cost dedicated, whereas the contract services utilize more modern machines dedicated to engineering applications. It is also noteworthy that only two Districts mentioned cost as a factor when comparing different contract services.

26. Operational mode. Approximately 50 percent of geotechnical applications are accomplished in the timesharing mode, 30 percent by remote batch, and 20 percent by in-house batch. Of course, the type of work weighs heavily on the mode used. For instance, those Districts doing a lot of dynamic and finite element analyses use the batch mode, while those offices concerned primarily with applications more conducive to brief, concise output, use the time-sharing mode.

27. Use of plotters and interactive graphics (IG). Computer plotting capabilities have apparently been well received by most geotechnical users. Most offices reported having access to plotters, but a few do not use them. Those not using them cited as reasons either a lack of need or a lack of software routines. Those offices using plotters reported applications such as plotting of instrumentation data (inclinometer, piezometer, base plate deflections, etc.), boring logs, slope stability results, seepage results, earthquake mapping data, earthwork quantity data, pile capacity data, finite element grids and results, stress plots, and soil test results.

28. The use of IG is somewhat more limited than the larger drum-type or flatbed plotters. This is primarily due to the fact that access to IG terminals has been limited and is just now becoming more common. Those offices that reported substantial use of IG (approximately 25 percent) seemed quite pleased with it, and many thought that they were still in the embryonic stage with respect to maximum utilization. As a matter of fact, when they were asked what is available on the market today that they did not have but would aid their computer use, most of the respondents said more IG and plotting capability.

29. Growth in computer use. When asked whether their computer use has grown significantly over the past few years, 20 offices responded affirmatively and 12 negatively. Reasons cited for increased use were:

a. Encouragement by supervisor.
b. Availability of time-sharing and development of new software.
c. More awareness of computer capabilities.
d. New personnel more familiar with computer applications.
e. Increasing work load.

Those who said their computer use has not grown significantly or declined in the past few years gave the following reasons:

a. Lack of need.

b. Problems in acquisition and development of programs.

c. Lack of time and manpower.

d. Decreasing work load.

e. Lack of support from their ADP Centers.

f. Lack of confidence in available software.

g. Lack of well-documented programs.

h. Frequent system changes.

Topic III: Present Program
Acquisition and Development

30. Source of applications. Eight Districts rely on in-house development for the majority of their computer applications. Twenty-four primarily use outside sources with in-house development ranging from limited to none. Although the order in which outside sources would be contacted when an office is seeking a particular application varied, the most popular sources were as follows:

a. Local ADP Center.

b. WES ADP or geotechnical personnel.

c. Directory of Computer Programs of Federal Construction Agencies.*

d. Other Districts where personnel have worked on similar projects using computer applications.

The source and percentage of programs currently being used by CE District geotechnical branches are:

In-house	Other CE Districts	WES	Outside CE
49	18	19	14

31. Program development. In answer to the question concerning preference by geotechnical personnel as to where program development should take place, 13 offices thought ADP personnel should handle this function

---

* National Academy of Sciences. 1977. "Directory of Computer Programs of Federal Construction Agencies," Federal Construction Council, Survey of Practice, Report No. 9-77, Washington, D. C.

because they have more expertise in computer language and programming and because of time and manpower restrictions within the geotechnical branches. Ten respondents felt development of programs should be done by geotechnical personnel because of their background and intimate knowledge of their own needs. If developed by geotechnical users, they would be intimately familiar with the workings of the programs and thus have definite advantage in fostering program confidence and streamlining debugging efforts. Six respondents felt a joint effort between geotechnical and ADP personnel is the best method for developing their applications. With this arrangement, geotechnical personnel would supply program objectives and guidelines and ADP personnel would do the actual programming.

32. Program modifications and debugging. Seventeen respondents stated that they (either geotechnical or ADP) make program modifications in-house to suit their own needs. Fourteen of these said they attempt to document the modifications but do this only as time allows (i.e., modification documentation is not a matter of policy). The remainder of those queried said they do not make modifications--if a program is not suitable and the required modifications are too extensive for the originating office to make, they do not use it. All but 10 Districts look to their ADP Center or the originating office to correct programming errors and perform debugging operations. Those 10 who do this internally considered their own geotechnical staffs to be sufficiently familiar with the internal operations of their programs to perform these operations.

33. Confidence in currently used programs. All 32 geotechnical branches reported they were confident that programs currently being used meet applicable design criteria. Twenty-two cited a comparison of results with manual analyses as the basis for their confidence, 12 cited intimate knowledge of the program, 11 cited confidence in author/originating office, and 1 relied on the program documentation.

34. Adequacy of program documentation. Thirteen of the 32 respondents stated that documentation of programs acquired from other CE offices was less than adequate. Fifteen respondents reported that documentation was generally adequate and up-to-date. When problems are

encountered with programs received from other CE offices, 20 respondents stated they would first contact the author or originating office, while 12 said they would first seek assistance from their ADP Centers.

35. Problems in program acquisition, development, and maintenance. Seven Districts reported no problems in program acquisition, development, and maintenance. The problems encountered by the remaining Districts were many and varied. The following were the most frequently stated problems.

a. Inadequate program documentation and user's guide (14).*

b. Frequent system changes resulting in program modification (6).

c. Time and manpower limitations (5).

d. Lack of qualified personnel in geotechnical branch (2).

36. Needed applications. The Districts were asked to list the computer applications they considered most needed at the present time. Again, as would be expected, answers varied due to varying work loads and type of work, but there were several common needs that stood out among the answers. These are (in order of most cited):

a. Data-base systems for storage and retrieval of instrumentation and boring log data.

b. More plotting capabilities, especially with respect to instrumentation, boring log data, and results of finite analyses.

c. More IG capability.

d. Well-documented and easier to use programs.

37. Technology transfer. Only seven respondents thought that current procedures for transfer of geotechnical computer information were adequate. A majority of the others reported current procedures to be grossly inadequate and offered the following suggestions for improvement:

a. A Corps-wide coordination effort for program development, maintenance, training, and technology transfer (28).

b. A master library or file of geotechnical applications with abstracts distributed to all geotechnical branches and ADP Centers (15).

---

* The number in parentheses refers to the number of CE District respondents.

c. More training courses on what is available and how to use it (7).

d. Standardized programs (7).

e. More coordination between Districts (7).

Topic IV: Current Working
Relationship with the ADP Center

38. General working relations. Most District geotechnical branches described their dealings with the ADP Center as informal, and on an as-needed and working-level basis. Nineteen respondents classified their general working relationships with the ADP Center as excellent, 11 as adequate, and two as inadequate.

39. Turnaround time. Seven geotechnical respondents classified ADP service with respect to turnaround time on their computer work (i.e., key punching, runs, plotting, etc.) as excellent, 18 as adequate, and four as inadequate. Even though the question referred primarily to turnaround time from their own ADP Centers, several Districts cited poor turnaround time when using time-sharing on the WES system.

40. Programming and technical support. Most respondents stated that their ADP Center provided them with adequate technical support. The largest complaint was that it takes too much time to get programming and technical work out of the ADP Center. However, several also stated that this was due in large part to a lack of manpower in the ADP Center. Four offices said their ADP Centers were just unresponsive to their needs.

41. Common complaints. The most common complaints from geotechnical users concerning the ADP Center are:

a. Too much time spent on functions that the ADP Center should handle, such as keypunching, acquisition of program documentation, conversion of existing programs, and verification of punched cards.

b. Lost time and effort because of frequent system changes.

c. Inadequate capacity of computers and inadequate software.

d. Lack of availability of graphics and plotting capabilities, including poorly done plots.

e. Inadequate access because of competition from other users (other engineering disciplines and administrative users),

remote location of terminals, working hours of the ADP Center (availability only on certain days, etc.).

f. Poor communication between geotechnical branch and the ADP Center.

g. Lack of distribution of geotechnical computer application and new hardware information by the ADP Center.

h. Lack of engineering programmers in the ADP Center.

i. Improper allocation of funds for various computer systems.

It should be noted that 14 of the 32 geotechnical branches surveyed reported no problems with their ADP Centers. The above-listed complaints were scattered among the remaining 18 respondents.

Topic V: Application Needs

42. The last topic of the questionnaire was intended to identify what the immediate specific applications needs of the various geotechnical branches were. Most of the answers grouped into four main categories: technology transfer and training, data-base management systems, IG and plotting, and access. The following paragraphs present a discussion of these categories.

43. Technology transfer and training. Twenty-seven Districts responded that improved technology transfer and training would increase their computer applications. They saw a real advantage in the establishment of a Corps-wide center for geotechnical computer applications to handle program acquisition and development, troubleshooting, information dissemination, training, etc.

44. The types of training considered to be most beneficial included:

a. Orientation or refresher courses on system hardware and software capabilities, use, and availability (14).

b. Courses on specific practical applications, such as seepage, slope stability, and well design (11).

c. Workshops on what is available and how to use it (10).

45. Data-base management systems. A comprehensive storage and retrieval system for maintenance and easy access of geotechnical data was deemed advantageous by 25 Districts. Suggestions given by several Districts concerning the composition of such a system are as follows:

a. Be locally centralized, not Corps-wide (such as on division level).

b. Allow for retrieval of results in final form for use in design manuals, reports, contract plans, etc.

c. Be flexible so that data may be analyzed and plotted in many different ways.

d. Reference data locations to a common coordinate system.

e. Simplify input data, keeping keystrokes to a minimum, so field personnel could code directly onto data forms to type directly on the terminal.

f. Have IG with hard copy capabilities, so data could be displayed for checks and final copies made.

g. Be able to use time-sharing terminal with plotter interface.

h. Store data on magnetic tape files.

i. Have flexible file format to allow extraction of pertinent data for cross-section plots, contour maps, pressure plots, etc.

46. Those offices that did not see any advantage to a comprehensive storage and retrieval system for geotechnical records maintenance said that it would result in a duplication of effort since most data would still have to be filed manually as presently done, thus resulting in a more expensive operation with no real benefits.

47. Improved IG and plotting capability. Ten Districts emphasized the need for improved IG capability for all practical applications (i.e., storage and analytical programs). Twenty-nine offices said that an extensive plotting capability for making working as well as final plots for boring logs, geological and soil profiles, slope stability, cross sections, laboratory test data, and seepage analyses would be most useful. However, several Districts warned that if turnaround time were not improved, the advantage of such a capability would be substantially curtailed.

48. Access. Seven Districts reported that new hardware capability resulting in improved access and turnaround time would be the most beneficial item for improving their effective use of the computer.

49. Other. Other needs mentioned by respondents included:

a. Improved system reliability.

b. Better communications with the ADP Center concerning geotechnical needs.

c. Improved program maintenance.

50. Reasons for lack of implementation. Reasons given for current lack of implementation of the listed needs are as follows:

a. Lack of time from qualified staff memebers (19).

b. Lack of funds (10).

c. Lack of technical computer knowledge (8).

d. Lack of support from the Engineering Division (5).

e. Lack of support from the ADP Center (4).

f. Lack of exposure to new ideas (1).

CE District ADP Centers

Purpose and scope of questionnaire

51. The CE District ADP questionnaire consisted of 26 questions, which can be grouped into six main topics. Topic I, "Present Capability," described the capabilities of the various ADP Centers in terms of available hardware and software. Topic II, "Current Computer Use," determined the degree of computer usage by geotechnical personnel. Topic III, "Acquisition and Development of Computer Applications," sought information about current ADP procedures in acquiring and/or developing geotechnical computer applications and thoughts and preferences concerning their present system. Topic IV, "Working Relationship with Geotechnical Users," ascertained, from the ADP point of view, how the two disciplines interface and what problems exist between the two. Topic V, "Communications and Technology Transfer," dealt with the transfer of technical information between the ADP Center and geotechnical branch and included training. The last topic, "New Applications in Geotechnical Engineering," identified the areas in geotechnical engineering that ADP personnel believed would benefit most from new computer applications.

52. The remainder of this section presents a summary of responses to questions from Topics I through VI. Completed questionnaires were received from the ADP Centers in 31 CE District offices.

Topic I: Present Capability

53. Equipment. There is considerable diversity of available in-house hardware in the CE. Three basic brand names of computers, GE

(Honeywell), Harris, and IBM, are being utilized, but system configurations seem to vary widely among the CE Districts and Divisions. Even more variation was noted in how and to what a particular system was dedicated. In some Districts, the in-house computer system is devoted almost exclusively to business and management applications, such as COEMIS and RA/PM, and engineering applications are processed on out-of-house contract systems and on the Division computer. This seems to work well in some Districts, but others reported problems with telecommunications, which result in user delays and dissatisfaction. Also, since the sources for contract services are subject to change from year to year, time is lost in adjusting to new systems. In other Districts, the Division computer is almost exclusively used for business applications, and contract services are utilized for all engineering applications. All this really points out is the extreme system variation existing in the CE today.

54. The type of hardware support equipment currently available to the CE user is equally diverse. For instance, some Districts have the latest IG terminals and plotting equipment, while others have none. The degree to which equipment is available to the user seems to depend on work load (i.e., available dollars) and how strongly the user pushes for acquisition. The acquisition of support equipment is, of course, much more of a local District decision than is the acquisition of a computer, which is almost totally beyond the local District's control.

55. Technical and operational capability. Present technical and operational capability consists of supporting both the business and scientific elements of the District. Engineering support in most Districts consists of programming, assistance in getting programs on the systems, and running the programs. The emphasis on engineering support versus business support seems to vary widely from District to District, with some offices very strong in engineering support and others (more business oriented) very weak. This does vary somewhat with the type and degree of work load, but even for Districts of similar size and work load the emphasis of the ADP Center may be completely different.

56. Fourteen ADP respondents reported that their present capabilities were adequate to support engineering application requirements,

regarding both equipment and technical support. Eleven respondents said their present capabilities were not adequate to provide the necessary support for engineering applications. Of these, most requested more manpower and/or equipment to alleviate the problem. Most equipment requests were for minicomputers, IG capability, plotters, and better communications equipment.

Topic II: Current Computer Use

57. ADP budgets. FY 78 budgets for District ADP Centers varied as widely as their equipment, staff size, and support capabilities. Yearly budgets ranged from $138,000 to over a million dollars. Those Districts with the largest budgets generally support Division ADP needs in addition to their own District needs. Such Districts indicated that the cost and time spent on Division ADP services take a significant portion of their total resources.

58. Regardless of dollar size of budgets, operations generally take a much bigger bite than technical support. However, 14 Districts reported sizable portions of their budgets were allocated to programming efforts. The percentage of funds spent for geotechnical applications ranged from 0 to 30 percent and averaged about 4 percent.

59. Effect of ADP costs. Of the 31 District ADP responses, only eight felt costs of ADP services presented a constraint to the user. Of these eight, three recommended the following changes, which they believed would more equitably distribute computer costs and thus reduce cost constraints on the user:

a. Acquire or increase use of minicomputers to reduce reliance on contract computer services for small- to medium-sized engineering applications.

b. Identify fixed costs of ADP service and distribute these costs equally among all District elements.

60. Computer use by disciplines. In 17 Districts, business and management applications reportedly require the bulk of ADP capabilities, especially in-house hardware. Of the technical organizations, hydraulics and hydrology applications reportedly account for the largest portion of ADP services in 16 Districts. The second largest users in the technical disciplines in most Districts appear to be structures and/or water

resources branches. Other technical computer users usually fall well below these three in computer use. Of course, the percentage use does vary considerably depending on overall missions and work loads.

61. Nonoperational geotechnical support. Twenty-one District ADP respondents reported that less than 5 percent of their staff's time is spent on geotechnical applications. Eight of these 21 said their staff spent little or no time on geotechnical applications. Six reported about 10 percent, and one reported 25 percent of their staff's time was spent on geotechnical applications. Most respondents stated that of the time spent on geotechnical applications about 50 percent was for program maintenance and 50 percent for new applications.

Topic III: Acquisition and Development of Computer Applications

62. Responsibility for new developments. Fifteen respondents reported that the ADP Center is responsible for development of any new computer applications in their District, while 12 respondents stated that development is a shared responsibility between the ADP Center and the functional element involved. Three Districts reported that development was entirely the responsibility of the functional element desiring the application.

63. In-house program development. In-house engineering computer program development reportedly takes place primarily in the ADP Center in 15 Districts, in the engineering functional element in seven Districts, and is a cooperative effort in eight Districts. When asked about their personal preference as to where in-house program development should take place, 10 respondents preferred that it take place in the ADP Center. Their reasons for this preference were generally the same:

a. Automatic data processing is a rapidly changing, highly technical field, which requires a continual updating of system knowledge. Part-time engineer programmers usually cannot devote enough time to the subject to maintain proficiency.

b. ADP personnel are generally capable of developing engineering programs that meet user criteria and, at the same time, make more efficient use of core memory requirements and peripheral devices.

c. Development in the ADP Center allows better control of program standardization, documentation, access, and availability for other potential users.

64. Seven ADP respondents stated that engineering programs should be developed in the engineering sections for the following reasons:

a. It is easier to teach computer programming to engineers than engineering to computer programmers.

b. The functional element engineer is more familiar with particular problem requirements and criteria.

c. The ADP Center does not have a sufficient number of trained personnel to meet engineering programming needs.

65. Fourteen respondents either had no preference or thought engineering program development should be a joint effort, with the best talents of both disciplines pooled. The engineer should develop the program requirements and objectives, ADP personnel should provide the actual programming, and implementation and verification of results should be a joint effort.

66. Out-of-house program development. The initiative in acquiring out-of-house developed engineering computer programs usually originates in the engineering functional unit. This initiative typically would consist of the engineer informing ADP personnel of his need for a certain type of program and requesting that the ADP Center do a literature search, determine the available programs that might meet the user's requirements, and acquire documentation on the most promising. In some Districts, ADP personnel route program announcements or abstracts to potential users. Some ADP respondents reported that if they saw something they thought was really useful, they would acquire it and then try to sell potential users on it, but normally they wait for potential users to show an interest or make their general needs known first.

67. Program implementation. In most cases (23 of the 31 offices surveyed), the responsibility for implementing newly acquired programs rests with the ADP Center. Their efforts are often aided by the engineer user who runs example problems and checks results after the ADP Center has the program operating. Debugging is usually a joint effort.

Topic IV: Working Relationship
with Geotechnical Users

68. Twenty-six ADP respondents reported good, active, and open working relationships with geotechnical computer users. Four respondents reported open but rather inactive working relations. Generally, ADP personnel in these Districts believe that the user should communicate his needs to the ADP Center. If they (ADP Center) do not get any requests from a particular user or functional element, they assume no assistance is needed. They view the ADP Center as a true service consultant, and as such, it is up to the user to identify his needs and ask for assistance when he needs it.

69. Common complaints. Seven ADP offices reported no complaints directed to them by geotechnical users. Twenty-three reported complaints such as:

a. Turnaround/response time too slow (12). The reason for this varies from District to District. Generally, though, the problem appears to be a result of remote systems becoming user-saturated. Aggravating the problem in some instances is slow turnaround time for in-house work, such as keypunching, program development, and program modifications.

b. ADP costs too high (4).

c. Poor quality of output, especially plots (4).

d. Inadequate or obsolete equipment (4).

e. Insufficient software (3).

f. Too many system changes, which result in program modifications (1).

g. Poor performance of programs acquired from out-of-house sources, particularly the WES (1).

It should be noted that several of the above complaints may be interrelated. For instance, slow response time and poor output quality may be related to inadequate and/or obsolete equipment.

70. Most ADP Center personnel who listed user complaints believed many to be justifiable complaints. Past attempts or suggestions for solving some of the problems were given as follows:

a. Turnaround/response time too slow. Some applications have been transferred to computer systems with less downtime or bigger capacities or in-house minicomputers, and more

remote terminals have been acquired. Slow response time to technical support requests is due primarily to a shortage or complete lack of trained engineering programmers. Respondents reported that there was little they could do about this problem until management saw fit to authorize one or more engineer programmer slots in the ADP Center. Some respondents have made use of overtime to help alleviate the problem on a short-term basis but did not consider this a long-term solution.

b. ADP costs too high. Costs complaints were generally justifiable, according to most respondents. Some suggested distributing all identifiable fixed costs for maintaining an adequate ADP Center to all functional and support elements in the District. They said this would result in a lower cost to heavy users and encourage lighter users to make greater use of ADP services.

c. Poor output quality. Solutions to problems involving output quality have consisted of transferring applications to more reliable equipment and monitoring the work more closely to catch the problems so that they may be corrected quickly.

d. Inadequate/obsolete and insufficient equipment. All respondents thought this complaint was valid but also thought there was little that they could do about it. They cited lack of available funds for acquisition of equipment and incredibly cumbersome procurement procedures for computer equipment.

71. User conflicts. Twenty-five ADP respondents reported that conflicts between administrative and engineering computer users was not a problem in their Districts. Some of these respondents stated that previous problems had been solved by assigning separate blocks of time for administrative applications and engineering applications or by assigning applications to separate systems. Some Districts said there were no conflicts because engineering use of the computer was so low that there was no competition. When conflicts do arise, most ADP respondents reported that they are usually settled by the ADP chief, acting as a mediator between the conflicting parties.

Topic V: Communications and Technology Transfer

72. Formal communication systems. ADP respondents were asked to describe their methods for communicating new technical developments in computer applications to users and their feedback system from users to the ADP Center. Two respondents described formal communications systems, which apparently work quite well in their Districts. Their systems

involved the establishment of an ADP coordinating committee consisting of representatives from each engineering element who are responsible for identifying new computer needs and developments to the ADP Center. The representatives are then responsible for informing their co-workers. Representatives also gather information concerning their respective functional elements' needs and are responsible for channeling this information back to the ADP Center.

73. Informal communication systems. Several respondents listed more informal systems such as:

a. Routing information to users via DF, newsletter, or "users notes."

b. Posting notices of new developments, training courses, etc., on ADP bulletin board.

c. Maintaining a library and distributing listings of available programs to users.

d. Conducting user orientation sessions for personnel interested in new programs and systems.

e. Displaying new information on IG screens.

f. Making personal calls to appropriate personnel.

74. Training. Of the 31 District ADP respondents, only two indicated they offered no training. Training available to users or potential users in the other Districts consists of the following:

a. Workshops held in-house for new applications/systems (17).

b. Assignment of new employees and engineer trainees to the ADP Center for certain periods, varying from 1 day to 3 months (14).

c. Computer service representatives brought in to conduct courses in use of new systems and applications.

d. Orientation sessions conducted periodically (7).

e. Occasional courses taught in basic programming (5).

f. Computer users are sent to off-site training courses as necessary (3).

Topic VI: New Applications in Geotechnical Engineering

75. Fourteen respondents stated that they were not aware of any areas in geotechnical engineering where new or increased computer use would be of benefit. Five respondents listed storage and retrieval

schemes for subsurface data, such as boring logs, as a possible area that would be of benefit. Four others suggested plotting capabilities for borings and other data. Other areas suggested for possible applications were:

a. Plotting routines for tsunami areas.

b. Soil-structure interaction.

c. Plotting of soils laboratory test data.

d. Statistical analyses for various test data.

e. Interactive finite element method.

f. IG applications for existing programs.

g. Earthquake epicenter and magnitude plots.

h. Plotting of instrumentation data.

i. Plotting of relief well data.

It should be noted that several of the respondents listing the possible new applications above thought that current manpower and budget restrictions would prevent them from being developed, at least within the ADP Center, in the near future.

Summary

CE Division geotechnical offices

76. As a general rule, CE District geotechnical elements are not making optimum use of the computer as an engineering tool. This is primarily due to:

a. Lack of knowledge of available programs and operating systems (data-base management in particular).

b. The scarcity of easily understandable and usable codes.

c. Lack of adequate documentation for programs written by other CE offices.

d. Lack of time (manpower) to become familiar with computer applications.

77. Technology transfer in the field of geotechnical computer applications is inadequate.

78. Current methods used to verify computer results are adequate.

79. CE Division offices can only provide limited guidance to CE District offices in order to increase their effective use of the computer, but if a good product is available, they can strongly encourage its use.

80. CE Division geotechnical offices have no real need for instituting or increasing computer use in their own offices at this time, but a real need does exist in Division soil testing laboratories.

81. Increased computer usage, if accomplished in a proper and rational manner (and this is stressed), can help in maintaining or increasing our present level of engineering proficiency.

82. CE Division geotechnical offices offered the following suggestions for increasing the present level of computer use in order to achieve maximum effectiveness:

a. Develop a data-base management system for transmission, storage, retrieval, and presentation of geotechnical data.

b. Establish a central office within the CE for geotechnical computer applications, with the responsibility for existing computer program review, documentation, dissemination, and modification to meet various system requirements, technology transfer, training, and troubleshooting. Such an office would not be responsible for writing new programs or establishing criteria.

c. Institute more training with emphasis on identifying available computer applications and their use rather than on programming, computer languages, etc.

d. Standardize computer systems and OCE approved programs.

e. Implement use of computer for data reduction, storage, transmission, and presentation at Division soils testing laboratories.

CE Division ADP Centers

83. Effective computer use by CE District offices can be increased. The degree of increase depends upon the present level of use by a particular office but could be substantial in some cases.

84. There are no known problems with user priorities at the Division level.

85. Technology transfer and communications between the ADP Center and the geotechnical user and vice versa are inadequate.

86. Generally, CE in-house computer hardware is obsolete.

87. Essentially no ADP support is being provided CE Division soils testing laboratories, but a definite potential for the computer does exist.

88. The following suggestions were offered by CE Division ADP offices for increasing the present level of effective computer use in CE District offices:

a. Provide new, modern in-house computer systems and keep system changes to an absolute minimum.

b. Provide more ADP manpower, especially trained engineer programmers.

c. Implement more user training and place more emphasis on communications between the ADP Center and the user.

d. Establish a software center for geotechnical computer applications, similar to HEC.

e. Reinstitute the brief program abstract system and circulate to potential users.

CE District geotechnical offices

89. More extensive use of the computer, especially for record keeping, can significantly reduce the number of man-hours required for nonjudgmental "busy" work.

90. Most soils sections are currently more computer oriented than geology sections, but considerable potential exists in the engineering geology field.

91. Computer costs are not considered a significant factor of overall design costs.

92. Current computer usage by geotechnical elements in the CE is relatively low.

93. The use of peripheral plotters and IG has been very well received by those goetechnical branches with experience in their use, but only a few have such experience.

94. A high degree of confidence exists in computer programs currently being used by geotechnical branches.

95. Problems exist in acquiring/developing and maintaining new computer applications in geotechnical engineering because of:

a. Inadequate program documentation.

b. Frequent system changes.

c. Time/manpower limitations.

d. Lack of qualified personnel.

96. Present means of technology transfer in the field of geotechnical computer applications are inadequate.

97. Working relations with the ADP Center are classified as generally good to excellent.

98. The biggest complaints geotechnical personnel had concerning their ADP Centers were:

a. Geotechnical personnel have to spend too much time on functions they think ADP personnel should handle.

b. Frequent system changes.

c. Inadequate hardware and telecommunications.

d. Poor communications between the geotechnical office and the ADP Center.

99. CE District geotechnical offices listed the following applications as their most urgent needs if the computer is to be used to its maximum effectiveness as an engineering tool:

a. Establish a Corps-wide center for geotechnical computer applications to handle program acquisition and development, troubleshooting, information dissemination, and training.

b. Implement more training for (1) system capabilities, uses, and availability, (2) specific practical applications, and (3) what is available and how to use it.

c. Establish a Division-wide data-base management system for transmission, storage, retrieval, and presentation of geotechnical data, such as information from borings, instrumentation, soil testing, cross sections, and soil profiles.

d. Increase and improve capability in IG and plotter use.

e. Improve user access and turnaround time.

CE District ADP Centers

100. There is considerable diversity in existing hardware and its use in the CE today. This situation creates difficulties in the exchange of software applications because of equipment noncompatibility.

101. Approximately half of those District ADP offices surveyed said their present capabilities were adequate to support present engineering application needs, while the other half stated they were not.

102. ADP costs generally do not present a constraint to users, although there were some user complaints about costs.

103. Use of the computer by geotechnical elements falls well short of use by other disciplines, such as hydraulics, hydrology, and structures.

104. In-house development of engineering applications varies. In some Districts it takes place in the ADP Center, in some it occurs in the functional element, and in others it is a joint effort.

105. The initiative in acquiring new out-of-house computer applications is usually taken by the functional element with the ADP Center providing support as needed.

106. Working relations with geotechnical users are classified as generally being good, active, and open.

107. Complaints most often received in the ADP Center from geotechnical users are:

a. Turnaround/response time too slow.

b. ADP costs are too high.

c. Poor quality of output.

d. Equipment inadequate (either insufficient in number or obsolete).

Most ADP respondents stated that many of these complaints are justifiable.

108. Generally, conflicts between administrative and engineering users are not a problem in most Districts.

109. Communications with geotechnical users are usually carried out on an informal basis. Only two Districts have formal communication systems.

110. Almost all ADP Centers offer some type of training for engineering users on a regular basis.

111. About half of the ADP respondents are not aware of any areas in geotechnical engineering where new or increased computer use would be

beneficial. Other respondents listed the following general areas that might benefit:

a. Data-base systems for management of geotechnical data.

b. More plotting applications.

c. More statistical type analyses of geotechnical data.

Recommendations

112. Based on the results of this survey, it appears that upgrading of geotechnical computer applications is both needed and desired by the majority of CE District and Division offices. It is recommended that this upgrading be accomplished by increasing capabilities in the areas of data-base management, interactive graphics and plotting, and technology transfer.

113. Specific recommendations for initial action are as follows:

a. A pilot data-base management system for instrumentation data be developed on a Division-wide basis and used and evaluated in one CE Division office. If found beneficial, it should be made available to all CE offices desiring to use it.

b. A seminar on geotechnical computer application be held to discuss the results of this survey and initiate efforts toward improving local and Corps-wide technology transfer. The seminar should be open to all interested CE individuals working in the geotechnical field as well as those in the ADP Center who are interested in working with their geotechnical people to improve their computer applications.

c. A committee be formed to develop plans and coordinate all efforts toward upgrading geotechnical computer applications. This committee should be composed of appropriate representatives from as many CE offices as possible.

Appendix A: Survey Questionnaires

CE Division F&M (Geotechnical) Offices

1. Do you feel the geotechnical branches in the Districts within your Division are utilizing the computer as an engineering tool to its fullest extent?

2. If no, what suggestions could you offer to implement more computer usage?

3. Please rank your Districts according to your best estimate of their effective use of the computer as an engineering tool in geotechnical engineering design and analysis.

4. Do you feel you could be instrumental in providing guidance to District geotechnical engineers that would improve their effective use of the computer (explain)?

5. What assurance do you have that computer applications utilized by your Districts are compatible with applicable criteria (i.e., manual check, confidence in program author, confidence due to past experience with program, etc.)?

6. How do you determine if new programs, which cannot be hand-checked (such as finite element), satisfy current design criteria?

7. Do you honestly feel increased computer usage, if accomplished in a rational and proper manner, could help in maintaining and/or increasing our current level of design in today's environment of overall manpower reduction? Please explain.

8. Do you feel there is any potential for use of the computer in Division soils laboratories (i.e., to reduce and plot test data, to provide a permanent storage and retrieval system, to provide quick access by Districts, etc.)?

9. To what extent does your office use the computer?

10. Do you feel that, as a review organization, there are any computer applications which you could utilize but at present do not? Please elaborate.

11. What are the reasons for needed applications not being utilized?

12. Do you see any advantages to a central program development and maintenance center for geotechnical computer applications in the CE?

CE Division ADP Centers

1. Please rank your Districts according to:

   a. Dollar amount of total computer usage.

   b. Dollar amount of computer usage by F&M branches.

   c. Your opinion of effective use of the computer.

2. Do you feel that the engineering Divisions in your Districts are, in general, using the computer to its maximum effectiveness?

3. What is needed, in your opinion, to increase effective use of the computer by your Districts (i.e., more versatile systems, increased manpower, increased funding, better technology transfer, better management, etc.)?

4. Do you have any policy regarding engineering user priorities on your in-house ADP system? Is access adequate?

5. Describe the ADP capabilities provided to your Division soils testing laboratories. Do you feel they are utilizing the computer to its fullest extent? If not, what would you suggest to increase their effective use of the computer?

6. Are there any ADP advisory committees or similar bodies that provide user feedback to ADP Centers in your Division?

7. Do you feel present communication regarding user needs and technology transfer in general is adequate? If not, what would you suggest to improve it?

CE District F&M (Geotechnical) Branches

Topic I: General

1. Briefly describe the general types of projects you are currently involved with and what type projects you anticipate to be involved with in the next 10 years (dams, flood protection, military, navigation, dredged material containment, etc.).

2. How many of the following personnel do you have in your F&M Branch? Engineers _____, Geologists _____, Technicians _____, Other _____.

3. Can you furnish an organization chart for your branch?

4. Would you describe your branch as being computer oriented?

5. Would you say your soils section or geology section is more computer oriented?

6. What technical functions presently require most of your resources (i.e., data collection, data storage, data retrieval, data analysis, design, preparation of design manuals, preparation of contract documents, etc.)?

7. What percentage of these functions are "busy work" as opposed to judgmental or analytical work?

8. Which of the above functions do you feel could be best aided by computer application (list by priority)?

Topic II: Present Computer Usage

1. Would you describe your average present computer usage on a typical project as being (a) low, (b) moderate, (c) high?

2. Estimate your average monthly ADP cost.

3. Estimate total average monthly man-hours spent on computer applications.

4. What percentage is the above in terms of your branch's total average monthly man-hours?

5. Do you feel computer cost is a significant factor of your overall design cost (i.e., do you avoid certain analyses because of computer costs)?

6. What in-house computer systems are you presently using? Describe each and give your estimated percentage use of each (i.e., with respect to total computer use)?

7. What contract computer systems are you presently using (WES, McAUTO, BOEING, MACON, etc.)? Describe each and give your estimated percentage use of each.

8. Rank the above systems in terms of usefulness and state reasons why.

9. Which of the following do you presently utilize (give percentage use of each): (a) remote batch, (b) in-house batch, and (c) time-sharing.

10. Do you currently utilize interactive graphics or plotters?

    a. If so, describe each use.

    b. If not, why not?

11. Has your computer usage grown significantly over the last few years?

    a. If so, estimate how much and state what this growth is principally due to.

    b. If not, why?

        (1) Lack of need.

        (2) Lack of awareness of capabilities.

        (3) Problems with system.

        (4) Problems with acquisition and development of programs.

        (5) Other; explain.

12. Do you know of anything on the market that you feel would aid your computer use, but you presently do not have?

13. Briefly describe computer applications you currently employ in the following areas of geotechnical engineering.

a.	Slope stability	Batch	Interactive
b.	Seepage	Batch	Interactive
c.	Seismic	Batch	Interactive
d.	Soil-structure interaction	Batch	Interactive
e.	Consolidation	Batch	Interactive
f.	Stresses in soil mass	Batch	Interactive

g. Storage and retrieval of instrumentation data — Batch — Interactive

h. Soil boring and test data — Batch — Interactive

i. Quality control data — Batch — Interactive

14. List computer programs used on a production basis (give program name, author, system used, frequency of use, and whether or not documentation is available).

15. Same as question 14 but for programs presently under development.

Topic III: Present Program Acquisition and Development

1. What is the source of the programs you are presently using (give number in each category)?

   a. Developed in-house.

   b. Other Districts.

   c. WES.

   d. Outside the Corps.

2. If you needed a program for a particular problem but did not have it in-house, where and how would you proceed to determine if such a program existed and if it did, how would you go about acquiring it?

3. Specifically, where would you look to see if a program was available within the Corps?

4. Do you modify programs obtainable from sources other than in-house to suit your own needs/system? If so, do you document the modifications?

5. Is your staff sufficiently familiar with the internal operations of your programs to correct programming errors? If not, who would you go to if errors were detected?

6. Are you confident that presently used programs meet applicable design criteria and, if so, upon what is your opinion based?

   a. Intimate knowledge of the program.

   b. A comparison of results (i.e., cursory program checkout).

c. Confidence in the author/originating office.

d. Other; elaborate.

7. Is documentation of programs received from other CE offices generally adequate and up-to-date?

8. Whom do you go to if problems are encountered with programs received from other offices?

9. Who approves of proposals for the development or acquisition of new applications?

10. Would you prefer to develop programs within your branch or by your ADP personnel? Why?

11. Do you have any programs or systems which you have developed or modified that you are particularly proud of or that you consider would benefit you? Would any of these programs or developments be suitable for inclusion in training courses or workshops?

12. What problems have you encountered in program acquisition and development and program maintenance?

13. Do you have needed applications but have not developed them because of cost/manpower limitations? What are they?

14. Do you believe current procedures for the transfer of geotechnical computer information are adequate? If not, what would you suggest for an improvement?

15. Do you see any advantages in a Corps-wide coordination effort for program development and maintenance?

Topic IV: Current Working Relationship with the ADP Center

1. Classify your general working relations with your ADP Center as (a) inadequate, (b) adequate, or (c) excellent.

2. Describe current working procedures with the ADP Center:

a. With respect to computer processing.

b. With respect to computer programming.

3. Do you obtain (a) inadequate, (b) adequate, or (c) excellent turnaround service from the ADP Center with respect to computer processing?

4. Describe limitations in ADP services that you feel retard full potential use of the computer as an aid to your work.

5. Is your relationship with the ADP Center basically on a working or managerial level basis?

6. Do you presently spend time on functions which you feel ADP personnel could handle? If so, what are they?

7. What is your biggest complaint with your ADP Center?

Topic V: Application Needs

1. In what area do you feel your main application needs lie (i.e., systems, program development, program maintenance, working relationship with the ADP Center, turnaround time, etc.)?

2. Specifically, and regardless of cost/manpower requirements, what new computer applications would you like to see?

3. Do you think you will implement any of the above in the next 5 to 10 years?

4. What are your reasons for not implementing desired applications to date?

   a. Lack of technical computer knowledge.

   b. Lack of support from the ADP Center.

   c. Lack of support from the Engineering Division.

   d. Lack of funds.

   e. Lack of enough time from qualified individuals on your staff.

   f. Other.

5. Within the geotechnical area there are many record-keeping functions, which must be maintained indefinitely (boring logs, test results, instrumentation data, quality control, aggregate sources, etc.);

   a. Do you see any advantage in developing a comprehensive storage and retrieval system for maintenance of these records?

   b. If yes, what type of systems would you believe to be most useful?

6. Do you believe an extensive plotting system for items, such as boring logs, stability and seepage results, and soil test data, which could be placed directly into design manuals and contract documents, would be useful?

7. Do you feel that more computer training is needed for your engineers, geologists, and/or technicians? If so, what type of training would you be most interested in?

8. Rank the computer applications for which you feel there is the greatest need within your organization.

CE District ADP Centers

1. Describe your current in-house ADP engineering configuration (include all terminals).

2. Describe your current out-of-house ADP engineering capability (indicate degree of use, i.e., inactive, minor, major, etc.).

3. Do you feel your present ADP capabilities (system and technical support) are adequate to provide the necessary support for engineering application needs? If not, what do you suggest is needed in order to alleviate the problem?

4. What is your current FY budget (break out into major category, i.e., operations, programming, etc.)?

5. What percentage of each category above would you estimate is for F&M?

6. Do you feel ADP costs present a constraint to the user?

7. What is the current average percent usage of your capability by each major engineering discipline and other applications (i.e., COEMIS-25%, F&M-10%, Hydrology-20%, etc.)? Also, please itemize this separately for each computer system used.

8. Within the past two years, what percentage of your staff's time (based on total staff time) would you estimate has been spent on F&M applications? How much of this time was (a) program development and (b) program maintenance?

9. Are your in-house (i.e., District) developed engineering computer programs developed primarily in the ADP Center or in engineering?

10. Do you have any preference as to where the development of engineering computer programs takes place? Why?

11. Who takes the initiative in acquiring out-of-house developed engineering computer programs, you or the discipline involved? Who do you think should?

12. Who has the responsibility for putting a newly acquired engineering computer program on your system?

13. How are priorities for computer time handled with engineering and administrative users? How are conflicts resolved? Are there any persistant problems?

14. How would you best describe your working relationship with geotechnical engineering users (active and open, inactive, needs communicated, support adequately provided, etc.)?

15. What do you feel are the most common complaints directed to you by the user? Specifically, by the F&M branch users?

16. Are they justified? If not, why; if so, what is being done to help eliminate them?

17. Do you have an organized method of communicating new technical developments (including new programs) and other useful information to computer users? Please explain. Is there a useful feedback system so that the user may communicate his needs to you?

18. Describe your ADP training program for engineering users. Do you provide periodic orientation sessions for new users? Are user workshops developed for new applications?

19. Are you aware of any areas concerning geotechnical engineering where increased or new computer usage would be beneficial?

20. Who is responsible for development of new ADP applications in your District?

21. Describe the engineering programming support within the ADP Center (number of programmers, job titles, grades, etc.)

22. Describe the engineering programming support outside the ADP Center (number of programmers, job titles, grades, organizations where located, etc.). Are these individuals formally delegated to this duty?

23. What are your thoughts on in-house (i.e., within the ADP Center) support versus outside support?

24. What are the ADP support needs for geotechnical users (in order of priority)? Do you have an organized plan to meet them? If so, can you elaborate briefly?

25. What are the factors that limit your meeting those needs (budget, manpower, justification, lack of cooperation in F&M, etc.)?

26. What technical functions require the bulk of your time? Please specify whether these functions are directed at engineering problems or managerial/administrative problems.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Hammer, David P
Results of geotechnical computer usage survey / by David P. Hammer, Robert D. Bennett. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1979.
31, 11 p. ; 27 cm. (Miscellaneous paper - U. S. Army Engineer Waterways Experiment Station ; GL-79-19)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C.

1. Computer applications. 2. Computers. 3. Data processing. 4. Geotechnical engineering. 5. State-of-the-art studies. I. Bennett, Robert D., joint author. II. United States. Army. Corps of Engineers. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Miscellaneous paper : GL-79-19.
TA7.W34m no.GL-79-19